SALTWATER CONTAMINATION IN THE UPPER FLORIDAN AQUIFER IN THE SAVANNAH/VERNONBURG, GEORGIA, AREA, 2004–2006

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Abstract. Since January 2004, and possibly as early as 2001, naturally-occurring saltwater has contaminated wells in the Savannah/Vernonburg, Georgia, area (Fig. 1, Hall and Carter, 2004; Hall and Peck, 2005). During April 2004, the City of Vernonburg implemented a program to monitor specific conductance in 12 contaminated wells. The purpose of this paper is to map the areal extent of high specific conductance in the Upper Floridan aquifer beneath the Vernonburg area during 2006 and to delineate specific conductance trends from February 2004 to September 2006.

Specific conductance measured during 2006 ranged from 212 to 9,320 microsiemens per centimeter at 25 degrees Celsius (µS/cm) in 26 wells and exceeded 1,000 µS/cm in 6 of the wells. Historical water-quality data collected from wells in the Savannah, Chatham County area indicate that specific conductance values greater than 1,000 µS/cm usually correlate with chloride concentrations exceeding the State and Federal secondary drinking-water standards of 250 milligram per liter (mg/L) (Georgia Environmental Protection Division, 1997; U.S. Environmental Protection Agency, 2000).

Data from the 12 wells monitored by the City of Vernonburg during 2004–2006 indicate that the specific conductance steadily increased in 7 of the wells, decreased in 3 wells, and remained about the same in 2 wells. A comparison of data from 20 wells that were sampled in February–March 2004 and September 2006, indicate that the specific conductance stayed the same in 12 wells, increased in 6 wells, and decreased in 2 wells.

The areal distribution of the specific conductance data from 2006 indicates that the area of the contamination has not substantially increased or shifted since 2004 (Fig. 2). In the central part of the saltwater contaminated area, however, the specific conductance increased in several of the wells by as much as 660 to 8,217 µS/cm, with one well having a conductance of 9,320 µS/cm. In the eastern part of the study area, the 2004 data indicated specific conductances ranged from 220 to 280 µS/cm; however, during 2006, a well was identified with a specific conductance of 1,002 µS/cm.

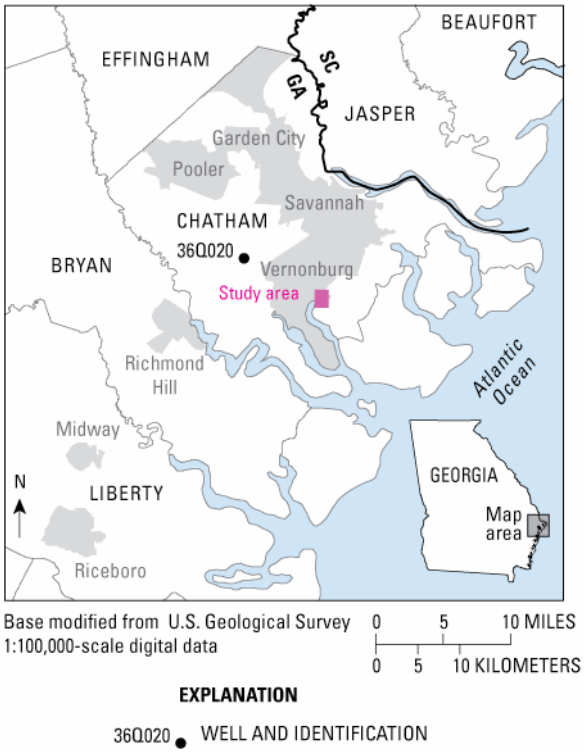
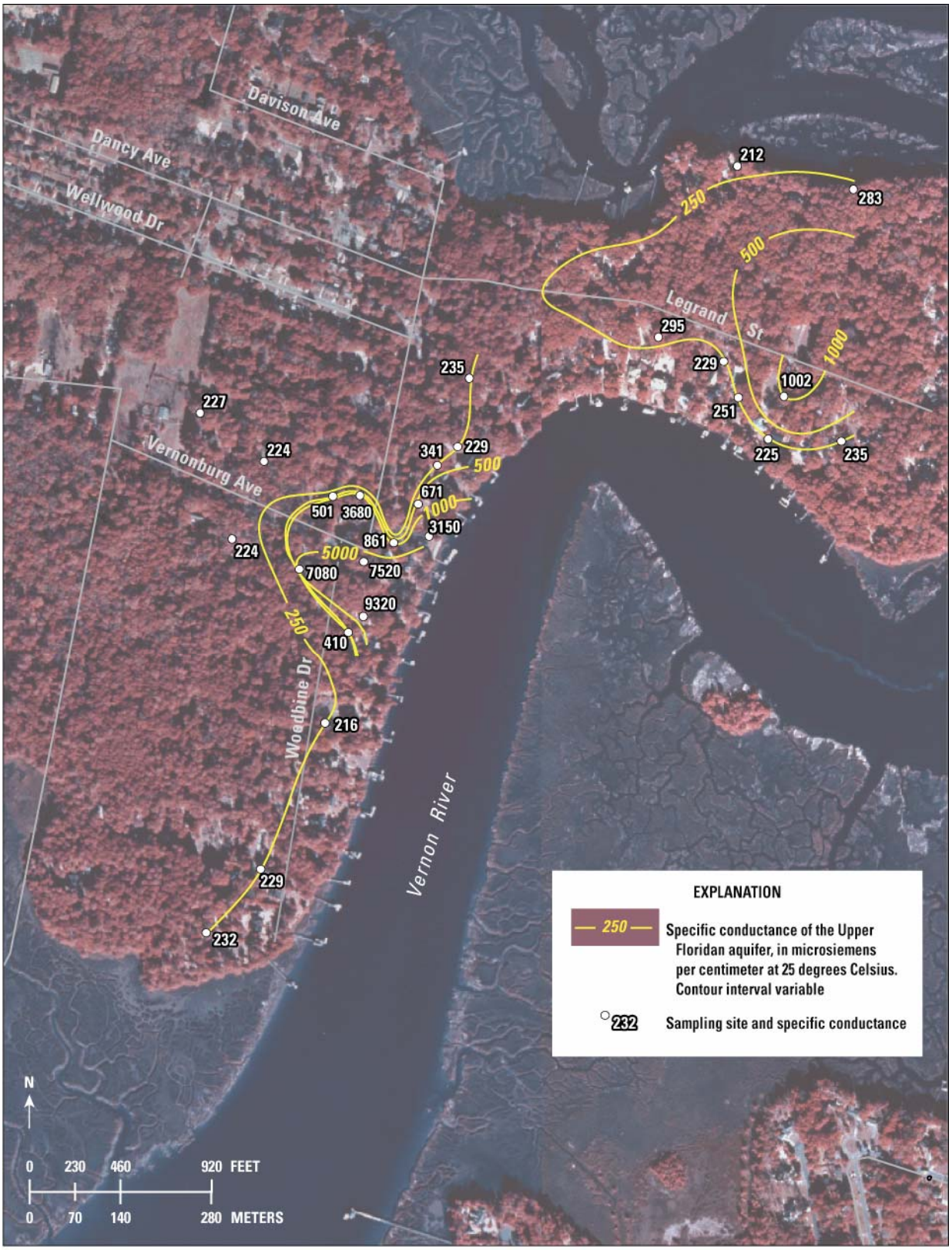


Figure 1. Location of study area, Vernonburg, Chatham County, Georgia.

Pumping in the Savannah area since the 1880s has reversed the normally upward hydraulic gradient, and resulted in the potential for downward leakage of saltwater to the Upper Floridan aquifer (Peck and others, 1999). Even with partial recovery of water levels in the Upper Floridan aquifer since 2000 (Fig. 3), the vertical hydraulic gradient is still (2006) downward from the surficial aquifer to the Upper Floridan aquifer. As a result, the specific conductance of water in wells located in the center of the high specific conductance area near Vernonburg has continued to increase.



Base from1999 CIR DOQQ, Georgia State Base Map Framework Data, Burroughs NE and Isle of Hope NW, 1:24,000 scale

Figure 2. Areal distribution of the specific conductance of water in the Upper Floridan aquifer, September 25–27, 2006, Vernonburg, Georgia, area. [CIR DOQQ, color-intrared digital orthophoto quarter-quad; NE, northeast; NW, northwest]

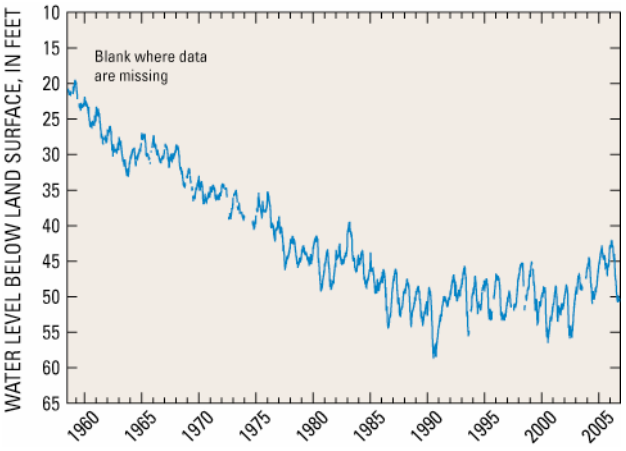


Figure 3. Daily mean water levels in well 36Q020, Chatham County, Georgia, 1958–2006.

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